Novel composite material intraoral prostheses

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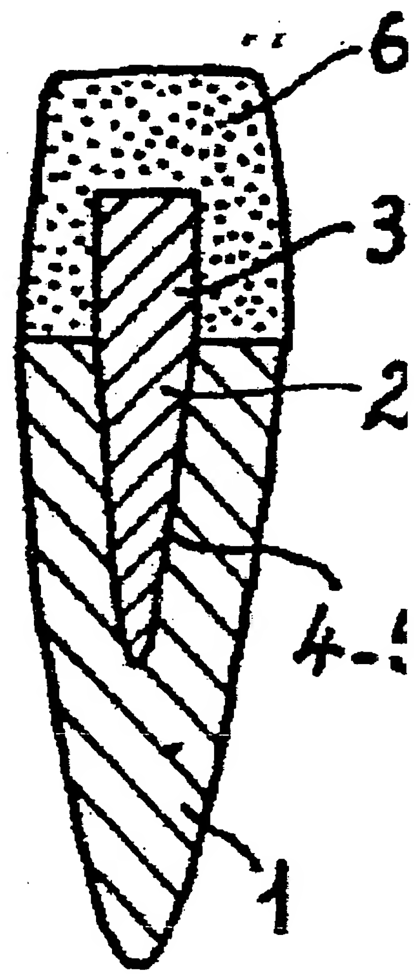
Abstract of **FR2588181**

These prostheses are used for making posts 2 for reconstruction inlays for false stumps.
They are made from composite materials reinforced with fibres with a high strength and having perfect biocompatibility. These fibres may be carbon fibres or chosen from glass, ceramic, boron, boron carbide or silicon carbide fibres and aramids and they are included in resins in the form of composite materials, these resins being chosen from epoxy and polyester resins.
These prostheses dispense with the use of any metal in the mouth and, consequently, all problems of oxidation and spreading of metal ions in the body which are linked with this use.



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New prostheses endo-buccal made of composite material

These prostheses are used to create types of claps 2 for false stumps or inlays for reconstruction. They are made from composite materiel reinforced by fibers with high resistance and perfect biocompatibility. These fibers can be carbon fibers or others from fiberglass, boron ceramic, boron carbon, silicon carbide and aramid fibers and ? included in these resins consisting of composite material, these resins are chosen from epoxy and ?
These prostheses prevent the use of metal in the mouth with all the oxidation problems related and branching out metallic organisms in the body.

The invention is a new endo-buccal prosthesis applicable inter alia in fixed prostheses, in reconstructed crowns, radiculars, crown-radiculars, prostheses, partial. total dental prosthesis on plate bases and clasps and to any surgical endo-buccal prostheses, as will be explained below.

It is known that the majority of present-day dental techniques, in the case of fixed dental elements of reconstruction, make use of multiple and various metal alloys whose interactions are not specifically inspected.

Thus, in the direct reconstruction method, use of a non-precious or precious alloy clasp associated with a precious or non-precious metallic alloys can lead to corrosion phenomenon; also thermal and mechanic constraints can lead to structural changes, problems in non-ventilated areas.

Reconstruction in accordance with the indirect method results, for the patient, in a long and difficult process of taking dental impression and the construction of a positive of this impression with all the possibilities for errors due to manipulation. An impression must then be made in the laboratory, a very long technique and onerous demanding great rigor to avoid any structural changes to the alloy. These impression requirements (temperature, coating quality) are difficult to respect.

An important association of metallic components leading to corrosion and oxidation can also be found.

Also, through oxidation, there can be expansion in the body of metallic ions, particularly nickel in non-precious alloys. In some countries, the use of non-precious metallic alloys is forbidden by the Department of Health.

Today's techniques of placing a reinforcing esthetic casing or replacement of the dental organ also present many inconveniences. When the casings are made without metal reinforcement, the lack of rigidity can lead to fractures of the prosthesis.

On the other hand, thermal shock leads to changes in volume at the cervical level where the cement seal breaks or is penetrated; adding to the risk of subsequent caries and infection of the supporting dental elements.

In the case of metallic support construction, an impression must be made in the laboratory requiring a long and onerous technology. The previously listed risks are always present for non-precious alloys. Finally, in the cosmetic use of organic resin and composite resin, there is no binding to the metal so the addition of mechanical retainers is required. These mechanical retainers fulfill, more or less, the gripping requirements.

Furthermore, today's failures experienced in implantation are due, in large part, to an insufficient bio-compatibility of the materials use, leading to the rejection of prosthetic elements and inter alia, not allowing the formation of an efficient and durable natural coupling between the salivary milieu and the intraosseous milieu, leaving a door opened for the entry of bacteria in all cases and forms of implant used and this leads to the rejection of the prosthetic element.

Finally, in the case of conservative dentistry, the methods used to increase the stability and retention of significant fillings present all kinds of inconveniences due to a lack of coaptation between the reconstruction material and the means of retention, which leads to fragile areas.

Also, when one uses a single screw post, only the mechanical coupling between the dental element and the filling is assured, at the exclusion of any physical or chemical bonding.

The purpose of this invention is to mitigate the above-outlined inconveniences by proposing a new endo-buccal prosthesis, eliminating the use of any metal in the mouth.

In accordance with the invention, these new prostheses are essentially constructed from highly resistant fibers and inter alia carbon fibers ultimately included in the resins in the form of composite materials.

These new prostheses have excellent resistance to breakage, higher rigidity, good fatigue resistance and a great stability against thermal and buccal shock.

They present, moreover, perfect biocompatibility that can be determined through a number of cell culture tests. Tests in saliva only allow for the detection of the expansion of the fiber-material composite group of elements.

This invention will now be described and the advantages will be well reflected in the description following, as reference, the annexed schematic diagram in which:

- Figures 1 and 2 are longitudinal sectional views of a construction mode of the invention applied to reconstruction inlays;
- Figures 3 and 5 are longitudinal sectional views of the two modes of construction of expansible clasps in accordance with the invention;
- Figures 4 and 6 are sectional views respectively of IV-IV and VI-VI of figures 3 and 5;
- Figure 7 is a longitudinal sectional view of a well intended for the construction of an esthetic well reinforcement;
- Figures 8, 9 and 10 are longitudinal sectional views of wells in accordance with figure 7 mounted on an apparatus to facilitate their application;

On figures, 1 shows the dental organ to be reinforced and 2, the prosthesis in accordance with the invention.

In the construction mode, represented in figures 1 to 5, prosthesis 2, in accordance with the invention, is used to construct the clasps to be used for reconstitution inlays and false stumps.

Clasp 2 represented in figures 1 and 2 is a single one-piece clasp consisting of a cylindrical part 3 attached to a generic part 4 geometrically similar to the drill used to prepare the housing for the said clasp in the tooth. This ensures perfect adaptation of the group providing for a minimum coupling between the tooth and the clasp when gluing, in the classical way, with an epoxy resin or photocuring.

In accordance with the invention, clasp 2 is constructed from composite materials reinforced with high resistant fibers. These fibers are, preferably, carbon fibers. They can also be any fibers having similar resistance and a perfect chosen biocompatibility, for example, among others, glass, ceramic, boron, boron carbide or silicon carbide fibers as well as the new aramid-type fibers.

This clasp can be obtained through several methods.

One can use a minimal mechanical [text missing???] cylindrical core made of a bundle of fibers mounted in a resin matrix. These fibers can be found in the form of bundles of, possibly wrapped, parallel fibers. They may also be in the form of tissues, knits or braids.

Moreover, the partially or completely pulverized resin can be chosen from different heat-cured resins such as epoxy resin or polyester.

The clasps can also be obtained from a mixture of these above-described materials, it is a question of mixing by pultrusion, injection, compression, transfer or a combination of some of these mixing methods.

One can finally coat a core by dipping in resin followed by a flocking of cut fibers and a polymerization in a suitable mold.

In figure 2, the mounting of the reconstruction inlay 6 on post 1 equipped with the clasp 2 in accordance with the invention can be seen.

The construction methods demonstrated in figures 2 and 3 show different expected expansion negative curvature clasps to reduce as much as possible ? between the tooth 1 and clasp 2 and to also minimize the amount of adhesive necessary to ensure solid joining of the two elements.

This is how the one-piece clasp shown in figures 3 and 4 is built of a negative curvature element 2 of a "goose feather" type, in accordance with the invention, of reinforced carbon fiber composite material. This negative curvature element is then locked in place by the introduction of a full clasp 7 of a diameter less than element 2 and which can be made of the same material or of another suitable material.

Figures 5 and 6 show an expansible negative curvature 2 composed of many parts 2a, 2b, 2c constructible in reinforced carbon fiber composite material in accordance with the invention and into which a conical core 3 designed. as in the previous construction methods, to ensure the expansion of the clasp once placed in the tooth.

We have presented all the advantages brought by the application of the composite material, in accordance with the invention, to the construction of the clasps which allow, first and foremost, control of the use of alloys or metals and any inconveniences which are directly linked to them: corrosion, expansion within the body of metal ions. The material used provides a partial biocompatibility.

Construction in the mouth without making an impression, eliminates any laboratory work and any particularly complicated techniques of attaching the metal.

The clasp, constructed of composite material in accordance with the invention, adheres perfectly to the composite construction material. It results in better retention and significantly more resistance.

Figure 7 illustrates the application of the prosthesis in accordance with the invention to the construction of an esthetic reinforcing or replacement cap for the dental organ.

Also, in this case, one eliminates any metallic element replaced by a cup 20 constructed of material in accordance with the invention and which is destined to support the cosmetic element 9.

Cup 20 is made from small semi-open products of carbon fibers. These can be found in the form of filament winding, of fabric, knits, braids or cut fibers in the mass. The construction methods for the cup can be very varied. Thus, they can be made by cutting a tubular braid following a flanging and adhesion of the cut end segments. Thus the obtained cap can then be mounted (Figure 8) on the interior mandrin 10 by, if possible, having an overlay on the adjustable edges of the cap 20 towards the interior or exterior thus allowing the practitioner to adjust, at his discretion, the height of the cap.

Also, the cap can be mounted (Figure 9) on an external mandrin 11, the edges of said cap also being flattened towards the interior or exterior. The banking and manipulation of the cap is thus facilitated. In the case where the external mandrin is deformed, cap can be put in place using finger pressure or an appropriate tool by turning it either inside or outside of the mouth.

Finally, in the construction method presented in figure 10, the cap 20 is mounted inside a deformable and transparent core 12 intended to facilitate the placement in the mouth of said cap 20. If one does not want to leave the core-assembly 12 –cap 2- in the mouth (or outside the mouth), the internal face of the deformable core 12 is made anti-adhesive by covering it in a compatible anti-adhesive material or inside a non-adhesive carbon matrix system.

The deformable core 12 is made of material known to allow the attachment of cap 20 to tooth 1, a layer of adhesive being placed between the two elements, the group being maintained with the help of clamp 13 and the patient putting pressure on the tooth with tooth 14 on the other side

Thus, it is possible to immediately adapt and without any intermediary molding of the teeth, the teeth together.

The cap can also be obtained by injection modeling or compression of a resin loaded with carbon fibers.

Once in place and attached within the mouth, it is coated with cosmetic material 9 which will be solidified through gluing (Figure 7).

In the case of plural prostheses, one or more bridge spans intended to receive the cosmetic element for one or more missing teeth can also be made of carbon fibers, in the form of fabric, kits, or braids, which will be glued to the caps of the bridge abutments before placing the cosmetic elements.

The carbon fibers, in the form of material, knits or braids, also have a very interesting use in partial or total dentures, in inclusion as reinforcement of the resins used today. The carbon fabric can also serve as a base for dentures.

Finally, one can resolve the adhesion problems in dento-facial orthopedics by replacing the metal fastenings or the resin base used today by fastenings manufactured as plated fabric, knitted or braided carbon fibers.

The new prostheses in accordance with the invention are also tailored to the preparation of glued bridges.

These new prostheses can be applied in implantology using a technique of construction in a laboratory on a culture of tissue, previously taken from the patient, onto an implant of cross-linked carbon fibers, prior to placing.

One imagines the interest created by the invention which brings an interesting solution to problems posed by toxicity of some dental alloys, while permitting cosmetic and functionally durable reconstructions.

These reconstructions are really of the same type from the internal section to the structure or external section

CLAIMS

1- Endo-buccal prostheses, characterized in that they are essentially made of highly resistant fibers having perfect bio-compatibility.

2- Endo-buccal prostheses in accordance with claim 1, characterized in that the highly resistant fibers are carbon fibers.

3- Endo-buccal prostheses in accordance with claim 1, characterized in that the highly resistant fibers are selected from glass, ceramic, boron, boron carbide, silicon carbide and aramid fibers.

4- Endo-buccal prostheses in accordance with claims 1 to 3, characterized in that the highly resistant fibers are included in resins in the form of composite materials.

5- Endo-buccal prostheses in accordance with claim 4, characterized in that the highly resistant fibers are selected from epoxy resin and polyesters.

6- Application of the prostheses in accordance with any of claims 1 to 5 in the construction of clasps for recontruction inlays

7- Application of the prostheses in accordance with any of claims 1 to 5 in the construction of cups for reinforcing esthetic caps.

8- Application of the prostheses in accordance with any of claims 1 to 5 in the construction of glued bridges

9- Application of the prostheses in accordance with any of claims 1 to 5 in the construction of implants.

FIG. 1 FIG. 2 FIG. 3

FIG. 4

FIG. 5

FIG. 7

FIG. 6

FIG. 10

FIG. 8 FIG. 9

FIG. 1

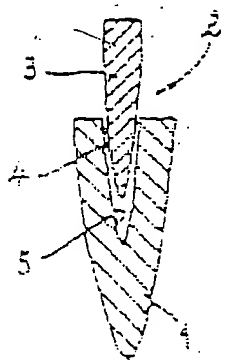

FIG. 2

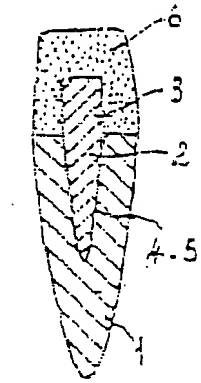

FIG. 3

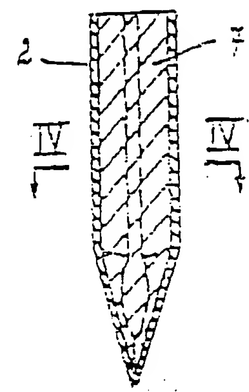

FIG. 4

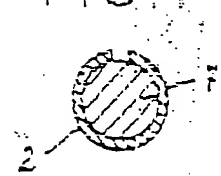

FIG. 5

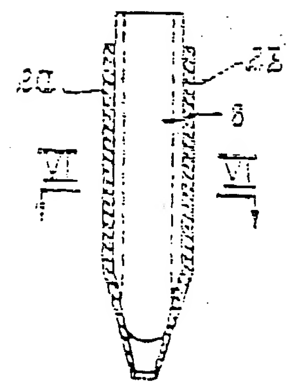

FIG. 6

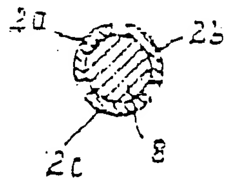

FIG. 7

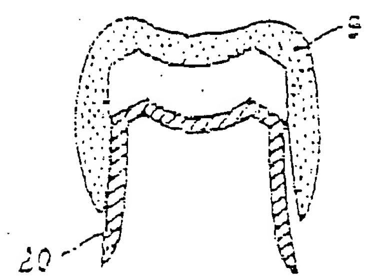

FIG. 8

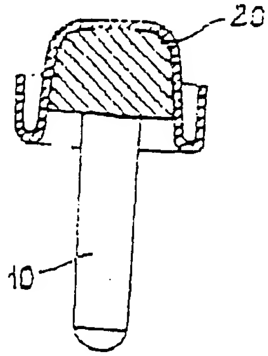

FIG. 9

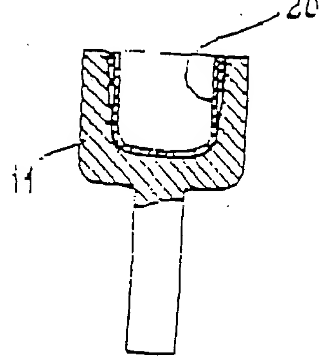

FIG. 10